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Is social support associated with patient-reported outcomes after joint replacement? A systematic review and meta-analysis

Wylde Vikki PhD[1,2], Kunutsor Setor K. PhD[1,2], Lenguerrand Erik PhD[1], Jackson John MBBCh[3], Blom AshleyW. FRCS, Full Professor[1,2], Beswick Andrew D. BSc[1]

[1]Musculoskeletal Research Unit, Translational Health Sciences, Bristol Medical School, University of Bristol, UK

[2]National Institute for Health Research Bristol Biomedical Research Centre, University Hospitals Bristol NHS Foundation Trust and University of Bristol, UK

[3]Histopathology Department, Royal Devon and Exeter Hospital, Exeter, UK

Correspondence to:

Dr Vikki Wylde, Musculoskeletal Research Unit, University of Bristol, Learning and Research Building, Southmead Hospital, Bristol, BS10 5NB

v.wylde@bristol.ac.uk

SUMMARY

Background

Identifying prognostic factors for outcomes after joint replacement could improve the provision of stratified care. This study evaluated whether social support is a prognostic factor for better patient-reported outcomes after total hip replacement (THR) and total knee replacement (TKR).

Methods

In this systematic review, MEDLINE, Embase and PsycINFO were searched from inception to April 2019. Cohort studies evaluating the association between social support and patient-reported outcomes at three months or longer after THR or TKR were included. Outcomes included pain, function, satisfaction and general health. Data were extracted from study reports. Study quality was assessed using the QUIPS tool. Data were synthesized using meta-analysis and narrative synthesis. The review was registered on PROSPERO (CRD42016041485).

Findings

Searches identified 5,810 articles and 56 studies with data from 119,165 patients were included. In meta-analysis, the presence of social support had a beneficial effect on long-term post-operative WOMAC (2,022 patients; mean difference 2.88; 95% CIs 1.30; 4.46) and Oxford Knee Score (69,570 patients; 0.29; 0.12, 0.45). Social support measured using a validated questionnaire was found to be associated with WOMAC pain (671 patients; 0.04; 0.00, 0.08) but not WOMAC function (671 patients; -0.01; -0.12, 0.11). The presence of social support had a positive association with some SF-36 subscales but not others. For all outcomes, results of narrative synthesis were inconsistent.

Interpretation

There is evidence that social support is a prognostic factor for some outcomes after joint replacement. Development and evaluation of complex interventions to improve social support and social integration is warranted.

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PANEL: RESEARCH IN CONTEXT

Evidence before this study

We did a thorough search of the scientific literature and PROSPERO before initiating this study to identify any existing or planned systematic reviews. Previous systematic reviews provided a broad overview of prognostic factors for outcomes after hip and knee replacement, but no existing or planned reviews focussed on social support.

Added value of this study

Our study is the first to use a comprehensive search strategy to identify relevant studies and conduct meta-analysis to quantify the effect of social support on patient-reported outcomes after hip and knee replacement.

Implications of all the available evidence

The finding that social support is a prognostic factor for some joint-specific and general health outcomes after hip and knee replacement highlights that the development and evaluation of interventions to improve social support and integration in this patient population is warranted.

BACKGROUND

Approximately 200,000 total hip replacements (THRs) and total knee replacements (TKR) are performed annually in the National Health Service (NHS) [1,2], and the need for this procedure has been predicted to increase [3]. Although the surgery is successful for many patients, 10-30% of patients experience long-term pain and functional limitations after surgery [4,5]. To optimise outcomes, there has been increasing interest in identifying prognostic factors for a poor outcome after joint replacement [6-10]. Identification of prognostic factors could facilitate the provision of stratified care and optimise outcomes. With the increasing volume of research on this topic, comprehensive systematic reviews are needed to summarise the existing literature.

Social isolation and loneliness are prevalent among patients undergoing joint replacement [11]. Social support is defined as a social network's provision of psychological and material resources [12] and has been shown to have a protective effect on general health [13]. However, the effect of social support on outcomes after joint replacement is unclear. The influence of social support has been considered previously within systematic reviews that evaluated numerous risk factors for outcomes after joint replacement [6,9,10,14]. Due to the broad scope of these reviews, only a small number of studies which assessed social support were included and the conclusions from these reviews have been conflicting. The aim of this systematic review was to synthesise longitudinal research evaluating whether social support is a prognostic factor for patient-reported outcomes after primary THR and TKR.

METHODS

The systematic review and meta-analysis was registered on PROSPERO, the international prospective register of systematic reviews (CRD42016041485). The review was registered as a larger project evaluating the impact of social support on different outcomes after joint replacement; other outcomes will be reported separately. Methods used follow guidance on systematic reviews of prognostic factor studies [15] and reporting follows guidance for meta-analysis of observational studies in epidemiology (MOOSE) [16], with a checklist provided in Appendix 1.

Selection criteria

Studies were eligible if they met the following criteria [15]:

Population: Adults undergoing primary TKR or THR. Studies that also included patients undergoing other procedures were included if separate results were available for THR or TKR patients.

Index prognostic factor: Measurement of social support

Comparator prognostic factors: Unadjusted and adjusted prognostic effect of social support were considered. For the adjusted prognostic effect, pre-operative pain/function was considered particularly relevant[10].

Outcome: Patient-reported outcome measure (PROMs) assessing pain, function, satisfaction or general health. Studies that used surgeon-administered tools, such as the American Knee Society Score or Harris Hip Score, were excluded because of the discrepancies between patients' and clinicians assessment of outcomes [17].

Timing: Social support assessed pre-operative or within the first six weeks of surgery and outcome at three months or longer post-operative.

Setting: Secondary care

Literature searches

MEDLINE, Embase and PsychINFO on the Ovid SP platform were searched from inception to 5th April 2019. Searches were conducted by an experienced systematic reviewer (ADB) and included terms to capture the concept of social support (Appendix 2). No language restrictions were applied and relevant non-English articles were translated and included. Searches were supplemented by tracking key articles in Institute for Scientific Information (ISI) Web of Science and handsearching of reference lists of systematic reviews . Conference abstracts and theses were excluded.

Screening

Bibliographic details of the articles identified in searches were exported and managed in an EndNote database. After removal of duplicates, an initial screening of titles and abstracts was performed by one reviewer (ADB) to remove clearly off-topic studies. The remaining titles and abstracts were then screened in duplicate by two reviewers (VW and ADB) and reasons for exclusion recorded. Full-texts of potentially relevant articles were acquired and assessed for eligibility in duplicate by two reviewers (VW and ADB), with disagreements resolved through discussion with a third reviewer. Author contact was planned to resolve any queries regarding eligibility but was not required.

Data extraction

Data from eligible articles were extracted into Microsoft Excel by one reviewer (VW) with checking against source articles by a second reviewer (ADB). Extracted data comprised: country, date, setting, population, participant demographics, assessments of social support and outcomes, statistical analyses and study quality. Authors of studies that were eligible for inclusion in meta-analysis but did not fully report results were contacted and data requested.

Study quality assessment

Study quality was assessed using the Quality in Prognostic Studies (QUIPS) tool [18]. Study quality was rated as high, moderate or low risk of bias for study participation; attrition; prognostic factor measurement; outcome measurement; confounding; and statistical analysis and reporting. Study rating was performed by one reviewer (VW) and checked by a second (EL); any discrepancies were resolved through discussion.

Data synthesis

Two or more studies were eligible for pooled analysis if they assessed outcomes at between 6-12 months post-operative with a validated tool and conducted multivariable analysis with adjustment for pre-operative pain/function. Summary measures were presented as mean differences. For data reported as medians, ranges, and 95% confidence intervals (CIs), means and standard deviations were calculated [19]. When reported estimates could not be

transformed, relevant data was obtained through correspondence with study authors. Given the heterogeneous assessment of social support (e.g. marital status, living arrangements, assistance during recovery) and the limited number of studies available for pooling, binary social support exposures were re-categorised to "social support present/absent" to enable a consistent approach to meta-analysis and enhance interpretation of findings. Continuous social support exposures were not re-catergorised. Differences in the direction of outcome scales were corrected for using standard methods [20]. Random-effects models, which take into account heterogeneity within and between studies, were used to combine mean differences [21] (parallel analyses used fixed-effect models). Heterogeneity across studies was assessed using the Cochrane χ^2 statistic and the I^2 statistic [22]. We planned to conduct sensitivity analyses and exclude studies from meta-analysis which were at moderate-high risk of bias on ≥2 domains, or at moderate-high risk of bias for prognostic factor measurement. However, at analysis stage, no studies met the criteria for exclusion from meta-analysis. For studies reporting outcomes separately for THR and TKR patients, we conducted stratified analyses and random effects meta-regression [23]. Formal tests of publication bias[24] were not performed as they have low power and are unreliable in pooled analysis involving >10 studies [20]. A narrative synthesis was performed for studies that could not be pooled. STATA release 15 (Stata Corp, College Station, Texas, USA) was used for statistical analyses.

Role of funding source

The study funder had no role in study design; data collection, analysis or interpretation; or writing of the report. The corresponding author had full access to all the data and had final responsibility for the decision to submit for publication.

RESULTS

An overview of the review process is provided in Figure 1. Searches identified 5,810 articles; 5,028 articles were discarded after reviewing the titles and abstracts as they clearly did not the meet the eligibility criteria and 786 articles were considered potentially relevant. After full-text screening, 55 met the selection criteria [25-79]. A further study was picked up from handsearching reference lists [80], and three studies from ISI tracking [81-83]. Five cohorts were reported in more than one article; three of these are combined in the results and two are

reported separately (further details in Appendix 3). Therefore, the results of 56 studies with 119,165 patients (median 258, range 35-66,769) are reported. Data for two studies [62,72] were provided by authors. An overview of studies is provided in Appendix 4 and individual study characteristics are summarised in Table 1 (further details in Appendix 3). Details of study quality are provided in Table 2. The domain most commonly rated as moderate or high risk of bias was study participation (n=37), followed by attrition (n=16) and statistical analysis and reporting (n=15).

The association between the presence/absence of social support and joint-specific outcomes was assessed in 25 studies. Nine studies were included in meta-analysis, with two studies at high risk of bias on one domain of study quality. Results are provided in Figure 2 for the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Figure 3 for the Oxford Knee Score (OKS). In pooled analysis of two studies with 2,022 participants the presence of social support was found to have a beneficial effect on WOMAC total scores (mean difference 2.88; 95% CIs 1.30; 4.46). Similarly, pooled analysis of four studies with 69,570 participants found social support was positively associated with OKS total scores (0.29; 0.12, 0.45). The effect on subscale scores was less consistent: the presence of social support had a beneficial effect on the OKS pain subscale (0.58; 0.09, 1.07) but there was no evidence of an effect on WOMAC function (2.60; -0.75, 5.95), WOMAC pain (0.51; -0.04, 1.05) or OKS function (0.15; -0.24, 0.55). Pooled analysis stratified by replaced joint suggested a slightly larger effect of social support on WOMAC pain and function after TKR compared with THR (Appendix 5). Results from the narrative synthesis were mixed. Eight studies, four of which were at high risk of bias on ≥1 domain, reported a positive association between the presence of social support and outcomes, including the WOMAC [29,43,46,63,65,71,76] and pain Visual Analogue Scale [41]. A lack of positive association was reported in 14 studies; six of these studies were at high risk of bias on ≥1 domain. Nine studies found a lack of association between presence of social support and WOMAC at between six months and seven years post-operative [29,43,46,47,59,63,65,74,75]. Other outcomes that were not associated with social support included the Hip disability and Osteoarthritis outcome Score (HOOS)/ Knee disability and Osteoarthritis outcome Score (KOOS) [37], Oxford Hip Score [79], and satisfaction [41,66]. In one study, patients who lived alone reported greater improvement in WOMAC function [60], however this study was at high risk of bias on four domains. The two studies included in narrative synthesis that were at low risk of bias for all domains found that the

presence of social support was associated with better WOMAC function at 6 months after THR [46] but not TKR [46,47].

The association between social support assessed using a PROM and joint-specific outcomes was assessed in 12 studies, and two studies with 671 participants were included in meta-analysis (Figure 2); neither study was at high risk of bias. In pooled analysis, there was evidence that social support measured using the Medical Outcomes Study Social Support Survey was weakly associated with WOMAC pain (0.04; 0.00, 0.08). No association was found with WOMAC function (-0.01; -0.12, 0.11), although there was evidence of substantial heterogeneity between contributing studies in this analysis. Results from the studies included in the narrative synthesis were again inconsistent. Six studies (two at high risk of bias on ≥1 domain) found a positive association between a measured aspect of social support and WOMAC total or subscale scores at follow-up. Social support measures included the Social Provisions Scale [28], Fragebogen zur sozialen Unterstützung [51], Medical Outcomes Study [52,80], DUKE social support scale [67], and unvalidated measures of spousal pressure and persuasion [70]. Most of these studies also reported no association between other aspects of social support and outcome [28,51,52,67,80]. No association was also found in four other studies, two of which were at high risk of bias on two domains. These studies evaluated associations between the Groningen Orthopaedic Social Support Scale and WOMAC [73], unvalidated measures of support social and WOMAC [49,82]; and the SF-36 social functioning domain and satisfaction [38]. Only one study included in the narrative synthesis was at low risk of bias on all domains; this study found that better scores on one subscale of the Social Provisions Scale (the reliable alliance subscale) was associated with better WOMAC total score at 3 months after THR [28].

The association between the presence/absence of social support and general health outcomes was assessed in 28 studies, and three studies with 2,515 participants were included in meta-analysis (Figure 4). One study included in meta-analysis was at high risk of bias for one domain. In meta-analysis, the presence of social support was found to have a beneficial effect on SF-36 total scores (2.78; 0.45, 5.11), and the subscales of role physical (17.45; 7.24, 27.66), social function (6.46; 0.62, 12.30), role emotional (12.83; 3.61, 22.05), mental health (6.46; 1.40, 11.52), general health (4.53; 0.55,8.51) but there was no evidence of an effect on bodily pain (5.88; -0.31, 12.06), physical function (4.28; -1.42, 9.98) or vitality (0.75; -4.60, 6.10). Results from the narrative synthesis were inconsistent. Twenty-one studies reported no positive association between the presence of social support and general health outcomes; 14 of these studies were at high risk of bias on ≥1 domain. Outcomes assessed included SF-36 or

SF-12 total or subscale scores [26,31,37,45,47,48,53,56,58,59,63,69], Nottingham Health Profile [40], EQ-5D [41,43,50,74], Instrumental Activity of Daily Living [42], Indicators of the Rehabilitation Status questionnaire (IRES) pain subscale [35], and Yale Physical Activity Score [33]. One study reported that being unmarried was associated with better self-care and transfer on the Functional Independence Measure but not locomotion [27] and another study found that a lack of family support was associated with better SF-36 Mental Component scores at 3 months [56]. Eight studies (four at high risk of bias on ≥1 domain) reported a positive association between the presence of social support and general health outcomes measured using the SF-36 of SF-12 total or subscale scores [36,56,58,63,71,76], IRES questionnaire mobility subscale [35], and World Health Organization Quality of Life-100 [78]. Three studies in the narrative synthesis were at low risk of bias on all domains; two studies found social support was not associated with SF-36 scores at 6 months after TKR [31,47] and one study found that the absence of social support was associated with poorer mobility but not pain at 6 months after THR or TKR [35].The association between social support assessed using a PROM and general health outcomes was assessed in four studies, with two at high risk of bias on ≥1 domain. Pooled analysis of these studies was not appropriate due to heterogeneity in the PROMs used to assess social support, and therefore narrative synthesis was undertaken. Three studies found that social support was not associated with SF-36 outcomes; PROMs used to assess social support included the ENRICHD Social support instrument [55], SF-36 social functioning subscale [68] and Groningen Orthopaedic Social Support Scale [73]. One study found that lower social support, measured with the DUKE social support scale, was associated with worse SF-36 physical function, physical role, vitality, emotional role and mental health but not bodily pain, social role, emotional role [67]. The one study at low risk of bias on all domains found that social support was not associated with SF-36 scores at 6 or 12 months after THR [55].

DISCUSSION

This article reports the findings from the most comprehensive systematic review and meta-analysis to date which has evaluated whether social support is a prognostic factor for patient-reported outcomes at three months or longer after primary THR and TKR. Results from the meta-analyses provide evidence that social support is a prognostic factor for some joint-specific and general health outcomes. Although the findings are promising, they should be interpreted with caveats; the measurement of social support was rudimentary in most studies,

the effects were small and findings from studies included in narrative synthesis were inconsistent. Despite this, this systematic review suggests that interventions to improve social support and integration for patients undergoing joint replacement warrant further exploration to determine if they could lead to clinically important improvements in outcomes.

It is important to acknowledge the limitations of this review when interpreting the results. Although a comprehensive search strategy was used, four studies were found that were not identified in initial searches, highlighting the difficulty in identifying relevant studies. Nevertheless, while it is acknowledged that some relevant studies may have been omitted, the tailored search strategy and in-depth focus on one prognostic factor facilitated the identification and inclusion of a greater volume of relevant literature than previous reviews, which have included fewer than five studies which assessed social support [6,9,10,14]. Also conference abstracts and other grey literature were not included in the review, which may have introduced publication bias [84] Another limitation relates to the methodological quality of the included studies. The most common methodological issue, affecting two thirds of included studies, was study participation. This was predominately related to studies recruiting from a single centre, which may have limited the generalisability of findings due to a selected or homogeneous population. Another methodological issue was the assessment of social support. The multidimensional nature of social support as a construct was not captured in most studies, which primarily focussed on the presence or absence of informal social support from family through assessment of marital status or living arrangements. This simplistic measure does not fully encapsulate the concept of social support or provide an indication of the quality of the different facets of support, including instrumental (provision of material aid), informational or emotional support [12]. A number of social support PROMS have been developed to allow a more comprehensive assessment, although only a minority of studies included in the review used such measures. Pooled analyses for the majority of outcomes were based on limited number of studies and some of the findings were also based on single reports, hence need replication in further studies.

Broader systematic reviews of prognostic factors for outcomes after joint replacement have drawn differing conclusions on the association between social support and patient-reported outcomes [6,9,10,14]. The main contributing factor to these discrepancies is likely to be the small number of studies identified and included in these reviews. Our review suggested that social support can exert a beneficial effect on patient-reported outcomes, reflecting that recovery from joint replacement takes place in a social context. There are numerous potential

mechanisms by which social support could influence outcomes, such as by reducing loneliness, providing psychological support, increasing ability to cope with stress, providing material resources to aid recovery, and increasing self-efficacy and confidence in resuming activities and mobilising after surgery [12,85-87]. Qualitative research has found that during the early recovery phase after orthopaedic surgery, family members are essential for providing informal care and supporting rehabilitation. Help from family members is required for most activities of daily living, including dressing, cooking, and bathing [88,89]. The presence of a trusted other can give patients more confidence to mobilise and become independent, through alleviating some of the fears associated with mobilisation, such as falls and accidents [90].

This review has highlighted the need for future studies to use validated PROMs to measure the quality of the different facets of social support to understand the relative contributions of instrumental, informational and emotional support to improving outcomes after surgery. The methodological quality of future studies could also be improved to generate higher quality evidence about prognostic factors, for example by conducting multicentre studies which implement strategies to minimise loss to follow-up. To inform changes to clinical care, studies are needed to evaluate interventions aimed at reducing social isolation and improving social participation. Social isolation is an issue for older people in general and identifying and overcoming barriers to social participation could improve physical and mental well-being [91]. Many studies included in this review assessed structural measures of social support e.g. marital status which are not amenable to modification; however, there are aspects of social support that could be targeted within clinical contexts. For example, in the context of orthopaedic surgery, patients often find group-based rehabilitation or information sessions positive as they offer the opportunity to meet people at a similar stage of recovery [92,93], suggesting that evaluation of peer-support activities and group interventions as a method of widening social networks is warranted. Another approach is to optimise the support provided by family members. Patients often prefer a communal approach to coping with chronic illness and ill health [86] and integrating significant others in the experience of joint replacement could improve the informational and emotional support available to patients. For example in osteoarthritis, an intervention that involved spouses in pain coping skills training was found to improve the health of patients [87]. Different interventions would be needed for patients who live alone, and optimisation of social care provision could lead to cost saving as living alone after joint replacement has been estimated to cost the NHS an additional £4.9 million per year due to longer length of stay and increased rate of hospital readmission [94].

In conclusion, this review found evidence that social support is a prognostic factor for some joint-specific and general health outcomes after THR and TKR. This suggests that the evaluation of interventions to improve modifiable aspects of social support and integration is warranted. There is complexity in developing such interventions because of the need for tailoring to individual needs and involvement of different organisational levels, such as community initiatives, health care, and social care, and therefore robust intervention development work is needed to inform the design of future interventions.

FIGURE LEGENDS

Figure 1: PRISMA flow chart

Figure 2: Meta-analysis of the association between social support (measured as present/absent or using a patient-reported outcome measure) and WOMAC outcomes

Figure 3: Meta-analysis of the association between social support (measured as present/absent) and Oxford Knee Score outcomes

Figure 4: Meta-analysis of the association between social support (measured as present/absent) and SF-36 outcomes

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AUTHOR CONTRIBUTIONS

ADB, EL, AWB and VW conceived and designed the review; VW, ADB and JJ screened studies; VW and ADB extracted data; VW and EL rated study quality; SK conducted meta-analysis; VW conducted narrative synthesis; VW drafted the manuscript; all authors revised the manuscript for important intellectual content.

DECLARATION OF INTERESTS

None of the authors declare any competing interest with the submitted work. Outside of the submitted work, VW and AWB receive institutional research funding from Stryker.

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ETHICS COMMITTEE APPROVAL

Not applicable

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